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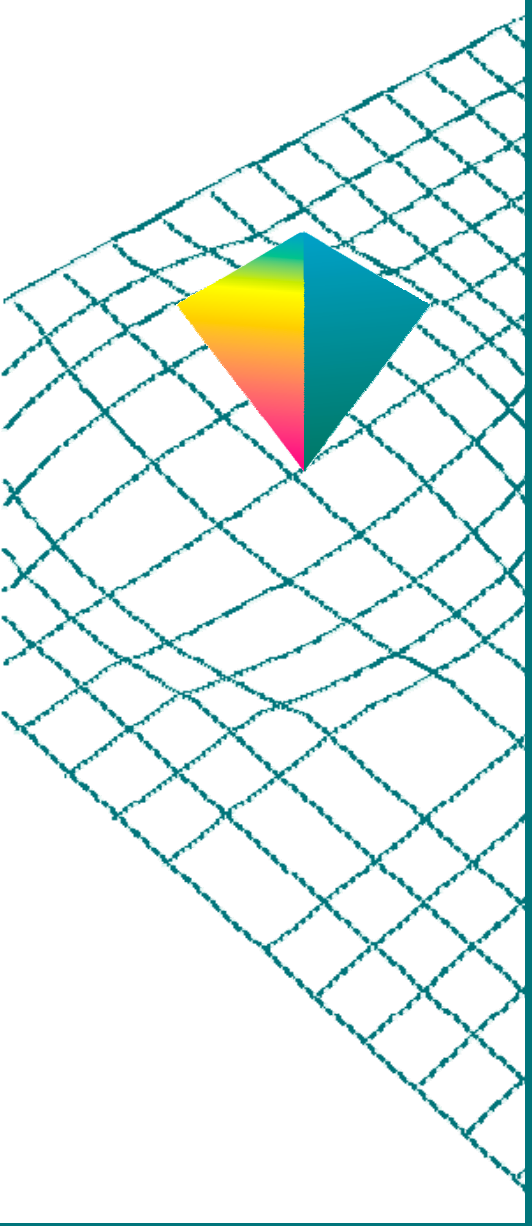

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50. Internationales Wissenschaftliches Kolloquium
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A GLOBAL SUPPLY CHAIN FRAMEWORK

ABSTRACT

We use a sample of Bulgarian firms to assess the robustness of the framework across different business environments as well as to better understand the supply chain competencies. Results suggest that the framework is reasonably robust across Bulgariain environments. Additionally, results confirm that supply chain competencies do lead to improved performance.

Introduction

The 21st Century Logistics framework, developed at Michigan State University and introduced in 1999, builds upon more than 15 years of research exploring leading logistics practices. While prior research had included international considerations, lending support to the 21st Century Logistics framework, the 21st Century Logistics framework was constructed based on domestic (U.S.A.) data and interviews (Bowersox, Closs, & Stank, 1999). Since its introduction, however, many authors have applied the framework to international environments (Mollenkopf and Dapiran 1999, Carranza, Maltz, and Antun 2002, Morash and Lynch 2002). Obviously, the 21st Century Logistics framework allows managers to identify and implement the competencies and capabilities characteristic of leading logistics and supply chain organizations. Therefore, the purpose of this research is to investigate the 21st Century Logistics framework in Bulgaria, using a specific Bulgarian sample to assess its relevance. The 21st Century Logistics framework identifies six firm competencies critical for logistics and supply chain management. The competencies leading to high supply chain performance can be grouped into operational, planning, and behavioral processes. Within the operational process, firm competencies include customer integration, internal integration, and supplier integration (whether material or service suppliers). Customer integration builds lasting distinctiveness with customers of choice. Internal integration links internally performed work to support customer requirements, and supplier integration links externally performed work into a seamless congruency with internal work processes. The planning process includes competencies of technology & planning integration and measurement integration. Technology & planning integration

refers to information systems capable of supporting the wide variety of operational configurations needed to serve diverse market segments.

Measurement integration refers to the development of measurement systems that facilitate segmental strategies and processes. Finally, in the behavioral process, relationship integration refers to the ability to develop and maintain a shared mental framework with customers and suppliers regarding inter enterprise dependency and principles of collaboration. Table 1 lists the capabilities and definitions for each competency.

A major challenge to empirically demonstrate the relationship concerns how to measure firm success. Firm performance must certainly incorporate financial measures, but should also include broader measures (Velev 2003). The 21st Century Logistics framework was developed using a measurement model that considers both firm and supply chain performance using 13 logistics and supply chain variables representing five key performance areas. Customer service focuses on the customer value-added including customer satisfaction, product flexibility, and delivery speed. Cost management focuses on the functional and integrated logistics and supply chain cost components. A single, comprehensive measure of total landed logistics cost is used. Quality reflects broader service measures used to enhance customer loyalty, based on the logic that superior service attracts and keeps key customers. The four quality measures include delivery dependability, responsiveness, order flexibility, and delivery flexibility. Productivity reflects how effectively material and labor resources are used to provide service, and includes information systems support, order fill capacity, and advanced shipment notification. Finally, asset management indicates how well a firm uses fixed assets and working capital. This research includes two specific asset utilization measures inventory turnover and return on assets (ROA). Although these five categories and the individual items can be measured quantitatively, the focus of this research uses performance relative to competition as the basis of cross-industry comparisons.

The current study

In the current study, the sample includes 26 responses from a different firms in Bulgaria. Table 2 summarizes the item-to-total correlations for the sample. The general conclusion is that the scales also work in Bulgaria.

The first analysis focuses on comparing firm competencies in Bulgaria with relative performance measures. The six competencies are used as independent variables in a series of regression models with each performance measure treated as a dependent variable. An overall logistics performance measure- the combination of the 13 performance measures-is also used in the

analysis. Table 3 reports the results of all regression models.

Competency and capability	Definitions
Customer integration	
Segmental focus	Development of customer specific programs designed to generate maximum customer success.
Relevancy	Maintenance and modification of customer focus to continuously match changing expectations.
Responsiveness	Accommodation of unique and/or unplanned customer requirements.
Flexibility	Adaptation to unexpected operational circumstances.
Internal integration	
Cross-functional unification	Operationalization of potentially synergistic activities into manageable operational processes.
Standardization	Establishment of cross-functional policies and procedures to facilitate synchronous operations.
Simplification	Identification, adoption, implementation, and continuous improvement of best practice.
Compliance	Adherence to established operational and administrative policies and procedures.
Structural adaptation	Extent to which the network structure and deployment of physical assets has been modified to facilitate integration.
Material/service supplier integration	
Strategic alignment	Development of a common vision of the total value creation process and planning clarity concerning shared responsibility.
Operational fusion	Linkage of systems and operational interfaces to reduce duplication, redundancy, and dwell while maintaining operational synchronization.
Financial linkage	Willingness to structure joint financial ventures with suppliers to solidify goal attainment.
Supplier management	Extended management to include hierarchical structure of suppliers' suppliers.
Technology and planning integration	
Information management	Commitment and capability to facilitate supply chain resource allocation through seamless transactions across the total order-to-delivery cycle.
Internal communication	Capability to exchange information across internal functional boundaries in a timely, responsive, and usable format.
Connectivity	Capability to exchange information with external supply chain partners in a timely, responsive, and usable format.
Collaborative forecasting and planning	Customer collaboration to develop shared visions and mutual commitment to jointly generated action plans.
Measurement integration	
Functional assessment	The development of comprehensive functional performance measurement capability.
Activity-based and total cost methodology	Adoption and commitment to activity-based costing, budgeting, and measurement of comprehensive identification of cost/revenue contribution of a specific entity such as a product.
Comprehensive metrics	Establishment of cross-enterprise and overall supply chain performance standards and measures.
Financial impact	Direct linkage of supply chain performance to financial measurement such as EVA, RONA, etc.
Relationship integration	
Role specificity	Clarity concerning leadership process and establishment of shared versus individual enterprise responsibility.
Guidelines	Rules, policies, and procedures to facilitate enterprise collaboration, leverage, and conflict resolution.
Information sharing	Willingness to exchange key technical, financial, operational, and strategic information.
Gain/risk sharing	Framework and willingness to apportion fair share reward and penalty.

Table 1 Competency and capability definitions (according Bowersox et al. 1999)

Standardized beta coefficients are shown in the table for all significant ($P < 0.05$) variables. Model significance is also reported in the last column. All R^2 values are significant at $P < 0.05$. 60% or more of the variation in overall logistics performance is explained by each model. The results show that customer integration explains substantial logistics performance for the Bulgarian sample. It is clear that Bulgarian firms that focus on serving customers with unique and profitable logistics offerings gain advantages in performance throughout the supply chain. This suggests that firms that develop and apply logistics and supply chain capabilities to meet the specific needs of key customers achieve higher performance in Bulgarian firms. The results show that internal integration and measurement integration explain limited logistics performance for the Bulgarian sample. The results do not reveal a significant statistical association between supplier, technology/planningor relationship integration with overall logistics performance.

As discussed by Stank et al. (2001), this could be because these competencies do not influence a firm's overall logistics performance. More likely, however, is the explanation that these competencies are not substantial differentiators of logistics and supply chain performance, at least based on current measures. This observation might suggest one of two conclusions. The first is that between supplier, technology/planning or relationship integration are not a necessary competency in Bulgaria. A more likely interpretation is that Bulgarian firms are smaller and have historically achieved supplier, technology/planningor relationship integration through relationships that are not possible due to the size and geographic spread of U. S. firms.

To provide a clearer picture of the role of the six competencies in affecting logistics performance, Table 3 also reports the multiple regression results for the Bulgarian sample when using each performance measure individually as a dependent variable. Each of the models is statistically significant. For the Bulgarian sample, supply chain integration competencies explain 60% or more of the performance variance related to customer satisfaction, product customization, delivery speed, delivery dependability, delivery flexibility, information supports system, and ROA (Gelev 2000).

For the sample, customer integration is the most common significant predictor variable relative to the other logistics competencies. For the Bulgarian sample it is a significant predictor for customer satisfaction, product customization, delivery speed, delivery flexibility, and information supports system.

Internal integration is the second most dominant predictor for the Bulgarian sample. For Bulgarian firms, it is a significant predictor of customer satisfaction, delivery speed, delivery dependability, and information supports system, and ROA. Firms that focus on creating customer integration competencies to provide high levels of customer service seem to need to develop high

levels of internal integration in order to deliver on the customer service promise.

Items	Item-to-total correlation
Customer integration	
• Segmental focus	0.81
• Relevance	0.78
• Responsiveness	0.79
• Flexibility	0.97
Internal integration	
• Cross-functional unification	0.98
• Standardization	0.98
• Simplification	0.95
• Compliance	0.95
• Structural adaptation	0.92
Supplier integration	
• Strategic alignment	0.7
• Operational fusion	0.9
• Financial linkage	0.9
• Supplier management	0.7
Technology and planning	
• Information management	0.9
• Internal communication	0.8
• Connectivity	0.8
• Collaborative forecasting and planning	0.9
Measurement integration	0.95
• Functional assessment	
• Activity-based and total cost methodology	0.94
• Comprehensive metrics	0.8
• Financial impact	0.8
Relationship integration	0.8
• Role specificity	
• Guidelines	0.9
• Information sharing	0.9
• Gain/risk sharing	0.83
Overall logistics performance	0.5
• Advanced shipping notification	0.6
• Customer satisfaction	0.5
• Delivery dependability	0.5
• Delivery speed	0.7
• Delivery time flexibility	0.35
• Inventory turns	0.3
• Information systems support	0.4
• Low logistics costs	0.4
• Order fill capacity	0.4
• Order flexibility	0.4
• Product flexibility (customization)	0.4
• Responsiveness to key customers	0.4
• Return on assets (ROA)	0.4
	0.4

Table 2 Item-to-total correlation

For Bulgarian firms, a significant amount of variation in customer satisfaction, delivery speed, product customization, delivery dependability, delivery flexibility, information systems support and ROA is explained by the combination of the three independent variables: customer integration,

internal integration and technology/ planning integration.

Dependent variables	Supply chain logistics competency Cell values represent standardized beta coefficients and indicate the statistically significant relative influence of that competency variable on the performance measure. R^2 value is significant at P=0.05.						
	Customer integration	Internal integration	Material/ Service supplier integration	Technology and planning integration	Measurement integration	Relationship integration	R^2
Overall performance							
Customer Service							
• Customer satisfaction	0.84	0.33					0.66
• Delivery speed	0.59	0.3					0.81
• Product customization	0.51						0.6
Cost management							
• Total landed logistics cost							
Quality							0.9
• Delivery dependability		0.65					
• Responsiveness							
• Order Flexibility							
• Delivery flexibility	0.3						0.8
Productivity							
• Information systems support	0.8	0.49					0.9
• Order fill capacity							
• Advanced ship notification							
Asset management							1
• Inventory turns		0.39		0.4			0.8
• ROA							

Table 3 Multiple regression results for Bulgarian sample

Conclusion

The relevance of the 21st Century Logistics framework has been demonstrated in Bulgarian firms. From an academic standpoint, the 21st Century Logistics framework has been shown to be robust across Bulgarian sample. It can be applied in a variety of environments to gain knowledge and understanding of how firms develop and employ their logistics competencies to create performance advantages in the marketplaces. The research does demonstrate that

•First, customer integration plays a significant role in firm performance for Bulgarian firms. Interestingly, customer integration seems to be the most important competency.

•Second, internal integration is not so important to Bulgarian firms than customer integration. This can be somewhat explained by the size of the Bulgarian firms. Because of their small size, their focus is the customer integration.

•Third, customer integration, internal integration, technology/ planning integration, all contribute to improved performance in asset management. Most interesting to observe is how companies in

Bulgarian sample use the capabilities to create different results. For example, they use customer integration to improve customer satisfaction, product customization, delivery speed, delivery flexibility, and information supports system. Bulgarian firms use internal integration to improve customer satisfaction, delivery speed, delivery dependability, and information supports system, and ROA. They use technology/ planning integration to improve ROA.

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